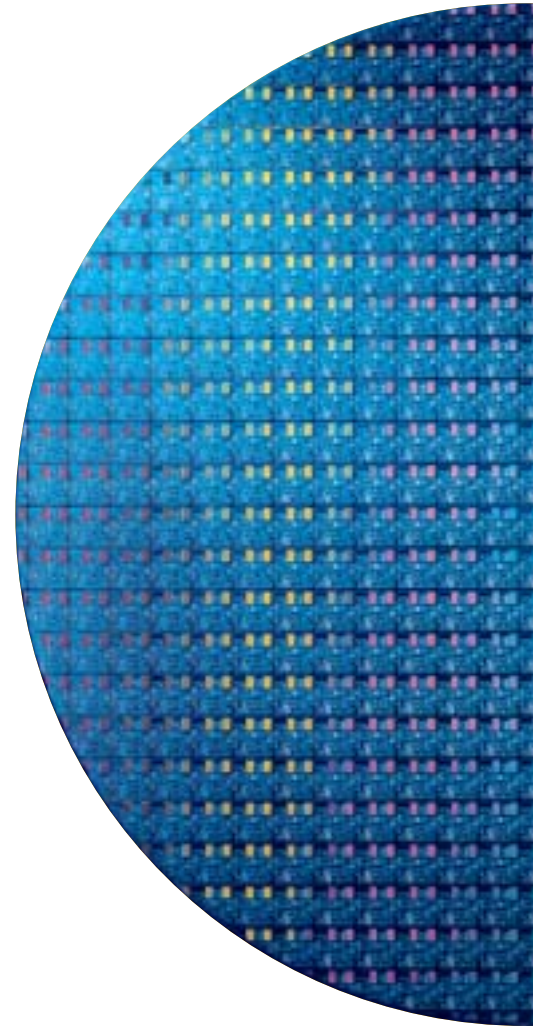




Building the Wireless Tomorrow

f r o m v i s i o n t o r e a l i t y

**Research &
Development
at Intel**





Always Connected

Ultra-Mobile. Easy to Use.

Intel is leading the industry from wireless vision to reality.

The convergence of computing, communications and mobility technologies is driving the global demand for always-on wireless capability – anytime and anywhere. As the world grows increasingly wireless, end users will want productivity and leisure solutions that keep pace with their new mobile lifestyle. They will expect reliable wireless capability, seamless roaming between networks, location-aware services and self-configuring devices with long battery life.

They will want new types of innovative wireless devices with the computing power to support voice-enabled interfaces, an endless array of updatable, media-rich services and the convenience of a secure and seamless wireless connection. They will expect to see bold new products that extend the benefits of wireless capability in entirely new ways.

And ultimately, they will want solutions that work.

Intel is working to ensure that end users enjoy the best experience possible with their wireless devices. Through innovations in computing and communication technologies and the promotion of open standards, Intel is delivering the device and wireless capability products and service deployment frameworks the industry will need to build the wireless tomorrow.

Wireless Work Style

You work for a fast-growing consulting firm, where you have free access to the company's wireless LAN. At work you enjoy an environment of constant connectivity with your primary work tools, your notebook and your PDA. After work on your drive home, both devices seamlessly shift from the wireless LAN to a connection with the wide area cellular network, updating files as you drive and downloading information you may find useful later.

As you pull into your driveway, the PDA connects with your home wireless network and updates your personal devices with your latest calendar information. Later that evening you decide to do some work at a local coffee shop. You take your notebook computer with you, and as you drive, it automatically connects with the cellular network and downloads several e-mailed documents. When you arrive, your notebook computer shifts from cellular to the shop's higher bandwidth wireless LAN. Sipping your latte, you begin e-mailing feedback to your work team.

How Intel is making this wireless vision a reality

This example of seamless roaming involves multiple devices on different wireless networks. Regardless of how many networks are involved, users will need just one online identity and receive a single bill.

Intel contributions

- Wireless Computing & Communications Products
- Characterization & Provisioning Software Technologies
- Intelligent Roaming
- Mobile Identity Technologies
- Mobile Standards



Connectivity

This broad category includes any method, protocol or solution used to connect devices to services over a wireless network, connect to the network itself or maintain direct peer-to-peer connections between devices.

Intelligent Roaming

This technology allows mobile users to maintain always-on secure connections as they move from place to place and from one network to another, seamlessly and without user intervention. Intel is conducting research and development to help perfect the components of intelligent roaming technology for use with a variety of wireless networks.

Mobile Identity Technologies

These technologies help users and service providers effectively manage the millions of virtual user identities as they connect to different networks, with different devices, in different parts of the world. Intel research is focused on the development of identity technologies and frameworks for deployment through service provider networks.

Internet Protocol version 6 (IPv6)

IPv6 is the next-generation Internet protocol that improves quality of service and always-on connectivity needed for the exploding population of connected devices. Intel continues to build key technologies and drive industry standards needed to accelerate the transition to IPv6 from IPv4.

Wireless Fidelity (Wi-Fi*)

Wi-Fi, also called 802.11, is a high-speed wireless LAN technology that is being used for wireless internet access in many locations around the world, including airports, cafes, corporate offices, universities, factories and homes. Intel, one of the originators of the Ethernet standard, has a complete family of Wi-Fi LAN products and is leading industry initiatives and investing millions of dollars to accelerate the adoption of Wi-Fi technology.

Universal Plug and Play (UPnP*) Development

UPnP* is a connectivity protocol that enables easy device configuration and networking by freeing users from the complexities of network setup, configurations and Internet protocols. Intel's UPnP software development kits for Intel® Personal Internet Client Architecture, Windows* CE and Linux* make it easier for application developers, hardware designers and device manufacturers to create affordable, easy-to-use home networking products.

Ultra Wide Band (UWB) Connectivity

UWB provides low power, low cost, short range, high-bandwidth wireless communications for the office and other "high density" environments. Intel research has shown that Wireless UWB networks could potentially run at speeds of up to one gigabit per second – more than enough to handle all the phone, television and Internet traffic for any home.



Being There – From Anywhere

You make your home in the Western U.S, and your father lives in London. Both of you are avid swimmers, and your dad is extremely excited now that your 8-year-old daughter is about to enter her first swim meet. He would give anything to be there, but can't make the trip. Fortunately, your multimedia-enabled phone includes a built-in video camera. You capture the action as your daughter dives into the pool for her first race, sending the real-time video to your parents across the globe.

On the way home from the swim meet, you decide to reward your daughter and her friends by taking them out to a pizza dinner. As you drive through the city, you receive real-time traffic updates, and nearby restaurants advertise their children's menus based on your request. Making your choice, you slow down as you see the restaurant sign ahead. Your smart phone communicates with a wireless technology-enabled parking meter to alert you to a vacant parking space, just around the corner. As you sit down in the restaurant, you give the phone to your daughter so she and her friends can play their favorite online video games before the pizza arrives.

How Intel is making this wireless vision a reality

This sketch illustrates Wireless Video Sharing, Customized Information Services, Entertainment, and Location-Aware Computing.

Intel contributions

- Wireless Computing & Communications Products
- Device Concept Designs
- Managed Execution Environment
- Characterization & Provisioning Software Technologies
- Mobile Standards
- Location-Aware Computing Technologies



Device Technologies

Intel is developing technologies that will help to accelerate the development of powerful, flexible and portable devices capable of taking full advantage of the convergence of computing and wireless capability. These technologies support active and passive interfaces to wireless networks and services, to enable more secure always-on connectivity.

Wireless Computing & Communications Products

Advanced wireless computing and communications technologies must combine robust applications performance with extended battery life in highly integrated silicon devices. Intel's industry-leading device and wireless technologies are designed to accelerate the development of tomorrow's wireless devices. They include Intel® Centrino™ mobile technology, Intel® Personal Internet Client Architecture (Intel® PCA), Intel® Xscale™ technology, Intel's Flash memory technology, Intel's wireless baseband chipsets and networking solutions for General Packet Radio Service (GPRS) and Wireless Fidelity (Wi-Fi* or 802.11).

Concept Device Technologies

To support the industry development of exciting new devices and capabilities, Intel develops concept devices based on leading-edge research in 3D graphics, mobile audio, mobile video codecs, scalable I/O, interconnects, and power management. This technology development is guided by extensive ethnographic user research to determine future user needs. By demonstrating and validating new ideas for wireless concept devices, Intel can accelerate the development of mobile solutions designed to meet user needs. Intel concept devices like the Portable Video Player (PVP) include Intel technologies and a proof-of-concept design.

Silicon Radio

Intel researchers are creating on-chip smart radio circuits with built-in, reconfigurable wireless networking functionality. These integrated radios offer always-on connections and switch seamlessly between different wireless networks. The integration of CMOS radio functionality directly onto the processor and chipset enables the development of less expensive, lower-power, multi-network, always-connected devices. Over time, these silicon technologies will enable new functionality and usage models like cell phones the size of an earring and mobile PCs that are always connected and always able to deliver information on any network, and any location.

Micro Electrical Mechanical Systems (MEMS)

MEMS are microscopic mechanical components that will enable future generations of low-power, ultra-small form factor devices for computing and wireless capability. Intel is conducting basic research to enable core technologies in the areas of antennae, displays, tunable filters, capacitors and inductors and micro-switches.



Music & Multimedia

You love music. While going for a morning jog and listening to your favorite radio station on a wireless headset connected to your cell phone, you hear a new song by one of your favorite groups. After your jog, you use the phone to access the Web and search for any MP3 recordings of the new song that may be available. You find it, along with several other new songs the band has released. After listening, you purchase several titles through your favorite online music retailer, and several tracks are immediately downloaded to your phone.

You are working on your Master's Degree through a remote-learning university. In addition to TV broadcasts, the university records class sessions in digital video format and posts them on their e-learning website. Using a notebook enabled with Intel® Centrino™ mobile technology, you have the high-performance video support and extended battery life needed to view your class material wherever you may be. You have the option of connecting to a live video stream or using your notebook computer to download and store lectures and course materials for later viewing. You keep learning, no matter where your busy schedule takes you.

How Intel is making this wireless vision a reality

This sketch provides an example of Wireless Music Delivery, Mobile Commerce, Multimedia Information Services and Distance Learning.

Intel contributions

- Wireless Computing & Communications Products
- Intel® Centrino™ mobile technology
- Managed Execution Environments
- Characterization & Provisioning Software Technologies
- Mobile Computing and Communications Standards



Services

Application Deployment

Known for its long history of enabling PC software developers, Intel has made significant contributions to the development of wireless applications and services. Intel's mobile software technologies and frameworks help application developers to more quickly develop, deploy and manage wireless applications and network services.

Managed Execution Environments (MEE)

MEE creates a software framework that insulates application and service developers from the variables of underlying platform differences between various devices. Instead of creating a different version of their software for every device platform, developers can focus on creating the best-performing application that it is capable of running on all devices on the network. Managed execution environments also enable carriers to more efficiently manage their services with added security. Intel works with developers to ensure their solutions are optimized for Intel® XScale™ technology, and develops high-performance MEE components for mobile application developers.

Characterization and Provisioning Technologies

These technologies enable more efficient delivery, display and adaptation of content to mobile devices. Device characterization and provisioning technologies enable a device to communicate its unique capabilities to a network or application/service provider. This data allows applications and services to be dynamically customized for that particular device, ensuring the best possible end-user experience. Intel is developing client and server-focused middleware and software development kits for the mobile developer community.

Location-Aware Computing

Location-Aware Computing customizes the information and services available to a user depending on their location. Intel is developing tools and application frameworks that allow developers and service providers to integrate location-aware capabilities into mobile applications and quickly deploy them across a variety of devices, enhancing their overall usefulness and effectiveness to end users.

Speech Application Language Tag (SALT) Specifications

This open specification is the foundation for speech-enabled input and output for all devices, including wireless clients. Intel is a primary contributor of specifications to the SALT Forum and was the first to create a variety of reference implementations for developers, available through Intel® Developer Services.

Convergence

“The convergence of computing and communications will be complete when consumers and businesses everywhere are always on the Net, and wireless is the primary way this will be achieved. Wireless will keep the user always connected, and connect all devices to each other all the time. Wireless is like the PC was 20 years ago – everything is changing so rapidly you can barely stay abreast of the frenzied, chaotic progress.”

Pat Gelsinger

VP and Chief Technology Officer, Intel Corporation

**For more information,
see how Intel is working to
build the wireless tomorrow at
www.intel.com/labs/wireless/bwt/**



www.intel.com/labs/wireless/bwt



Wireless connectivity requires additional software, services or external hardware that may need to be purchased separately. Availability of public wireless access points limited. Wireless home network experience may vary. System performance, battery life and functionality will vary depending on your specific hardware and software.

Copyright © 2003 Intel Corporation. All rights reserved. Intel, the Intel logo, Centrino and Intel XScale are registered trademarks of Intel Corporation or its subsidiaries in the United States and other countries.

*Other names and brands may be claimed as the property of others. 0103/AvM/HB02-670/PP/10K 252186-001